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M16C/60 Series and M16C/20 Series

General-purpose Program for Example for Initial Setting Assembler

1. Abstract

This program is an example of initial settings accomplished by using the directive commands of the assembler.

2. Introduction

The program shown here consists of the following:

(1) Map file information output
(2) Global symbol name specification
(3) Numeric symbol definition
(4) RAM area allocation
(5) Bit symbol definition
(6) Initial setup program
- Interrupt stack pointer setting
- FB register setting
- SB register setting
- INTB register setting
- RAM clear

(7) Main program
(8) Peripheral I/O interrupt vector table
(9) Nonmaskable interrupt fixed vector table

The following shows the range of the FB and SB relative addresses in this program.

FB	380H to 47FH -128 ↑ -400H ↓ + 127
SB	480H to 57FH 400H ↓ + 255

3. The example of a reference program

```
;*********************************************************************
; *
; M16C General-purpose Programs *
; CPU : M16C *
; *
;*********************************************************************
;===============================================================
; Title     : Initial settings using assembler's directive commands
; Outline   :
;             (1) Assemble control
;             (2) Address control
;             (3) Link control
;             (4) List control
;             (5) Branch instruction optimization control
; Notes     :
;===============================================================
;////////////////////////////////////////////
; Map file information output
;////////////////////////////////////////////
            .VER     'Ver1.02'          ; 'Ver1.02' is output when generating
                                        ; map file
;
;////////////////////////////////////////////
; Global symbol name specification
;////////////////////////////////////////////
                                        ; [Global symbol specification]
            .GLB     RUTINE             ; Externally referenced symbol
            .GLB     MAIN               ; Public symbol
;
                                        ; [Global bit symbol specification]
            .BTGLB      P2_4            ; Externally referenced symbol
            .BTGLB      P0_7            ; Public symbol
;
;////////////////////////////////////////////////////////////////////////////
//
; Numeric symbol definition
;////////////////////////////////////////////////////////////////////////////
//
VramTOP     .EQU     000400H           ; Declares start address of RAM
VramEND     .EQU     002BFFH           ; Declares last address of RAM
VIstack     .EQU     002C00H           ; Interrupt stack pointer
VproTOP     .EQU     0F0000H           ; Declares start address of program
Vintbase    .EQU     0FFD00H           ; Declares start address of variable
                                       ; vector table
Vvector     .EQU     0FFFDCH           ; Declares fixed interrupt vector
                                       ; address
;
CNT125ms       .EQU     125             ; Sets 125 in CNT125ms
;
AUTOchar       .EQU     -8              ; Sets -8 in AUTOchar
;
            .FORM       45,160         ; [List output control instruction]
                                       ; Specifies 45 lines, 160 columns per
                                       ; page of list file
```

```
            .LIST       ON              ; [List output control]
                                        ; Outputs assembler list
            .PAGE       'RAM'           ; [List page break and title
                                        ; specification]
            .SECTION    MEMORY,DATA     ; [Section name specification]
                                        ; Declares DATA attribute section of
                                        ; section name “MEMORY”
            .ORG     VramTOP            ; [Absolute address setting]
                                        ; Sets location to 400H
;////////////////////////////////////////
; RAM area allocation
;////////////////////////////////////////
                                        ; [RAM area 1-byte allocation]
CHAR:           .BLKB       10          ; Allocates 10-byte area
;
                                        ; [RAM area 2-byte allocation]
SHORT:          .BLKW       10          ; Allocates 20-byte area
;
                                        ; [RAM area 3-byte allocation]
ADDR:           .BLKA       10          ; Allocates 30-byte area
;
                                        ; [RAM area 4-byte allocation]
LONG:           .BLKL       10          ; Allocates 40-byte area
;
                                        ; [Single-precision, floating-point
                                        ; RAM area allocation]
SFLOAT:     .BLKF       10              ; Allocates 40-byte area
;
                                        ; [Double-precision, floating-point
                                        ; RAM area allocation]
DFLOAT:     .BLKD       10              ; Allocates 80-byte area
;
CHECK:          .BLKW       10
;
;////////////////////////////////////////
; Bit symbol definition
;////////////////////////////////////////
BIT4        .BTEQU      4,CHAR          ; Sets bit 4 of displacement CHAR to BIT4
MSB         .BTEQU      15,SHORT        ; Sets bit 15 of displacement SHORT to
                                        ; MSB
P0_7        .BTEQU      7,3E0H          ; Sets bit 7 at address 3E0 to P0_7
;
            .SECTION    PROG,CODE       ; Declares CODE attribute section of
                                        ; section name “PROG”
            .ORG     VproTOP            ; Sets location to F0000H
            .OPTJ       OFF             ; [Branch instruction optimize
                                        ; specification]
                                        ; Does not optimize branch instruction
                                        ; after this line
            .FB      VramTOP            ; [Assumption of FB register value]
                                        ; Assumes 400H for FB register value
            .SB      VramTOP+80H        ; [Assumption of SB register value]
                                        ; Assumes 480H for SB register value
            .FBSYM      SHORT           ;
            .SBSYM      CHECK           ;
```

```
;=======================================
; Program start
;=======================================
RESET:
   LDC      #VIstack,ISP                  ; Sets interrupt stack pointer
;
   LDC      #VramTOP,FB                   ; Sets frame base register
   LDC      #VramTOP+80H,SB               ; Sets static base register
   LDINTB      #Vintbase                  ; Sets interrupt table register
;
   MOV.W       #0,R0                      ; Sets store data (0)
   MOV.W       #((VramEND+1)-VramTOP)/2,R3 ; Sets number of transfers performed
   MOV.W       #VramTOP,A1                ; Sets address where to start storing
   SSTR.W                                 ; Executes clearing of RAM
;
   FSET     I                             ; Enables interrupt
;
;===========================================
; Main program
;===========================================
MAIN:
   MOV.W       #1234H,SHORT
;
;
   MOV.W       #5678H,CHECK
;
;
   JSR      ROUTINE
   BSET     P0_7

   ;(Here is your program.)

ROUTINE:
   ;(Here is your program.)
   RTS
NOTUSE:
   ;(Here is your program.)
   RTS
```

```
            .PAGE       'VECTOR'
            .SECTION    UINTER,ROMDATA   ; Declares FOMDATA attribute section
                                         ; of section name “UINTER”
            .ORG Vintbase                ; Sets location to FFD00H
;=============================================
; Peripheral I/O interrupt vector table
;=============================================
            .LWORD      NOTUSE           ; Software interrupt number 0
            .LWORD      NOTUSE           ; Software interrupt number 1
            .SECTION    INTER,ROMDATA    ; Declares FOMDATA attribute section
                                         ; of section name “INTER”
            .ORG     Vvector             ; Sets location to FFFDCH
;=============================================
; Nonmaskable interrupt fixed vector table
;=============================================
            .LWORD      NOTUSE           ; FFFDC to F Undefined instruction
            .LWORD      NOTUSE           ; FFFE0 to 3 Overflow
            .LWORD      NOTUSE           ; FFFE4 to 7 BRK instruction
            .LWORD      NOTUSE           ; FFFE8 to B Address coincidence
            .LWORD      NOTUSE           ; FFFEC to F Single stepping
            .LWORD      NOTUSE           ; FFFF0 to 3 Watchdog timer
            .LWORD      NOTUSE           ; FFFF4 to 7 Debugger
            .LWORD      NOTUSE           ; FFFF8 to B NMI
            .LWORD      RESET            ; FFFFC to F Reset
;/////////////////////////////////////////
; End of assemble direction
;/////////////////////////////////////////
            .END
;
```

4. Reference

SOFTWARE MANUAL
M16C/60 M16C/20 Series SOFTWARE MANUAL
(Acquire the most current version from Renesas web-site)

5. Web-site and contact for support

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http://www.renesas.com

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REVISION HISTORY

Rev.	Date	Description	
		Page	Summary
1.00	Jul 08, 2002	-	First edition issued

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